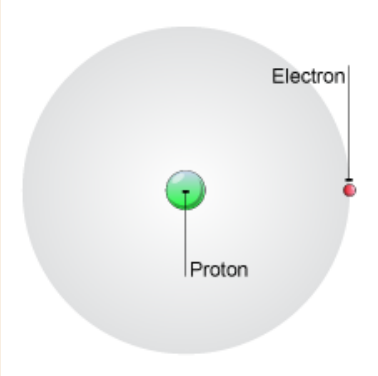
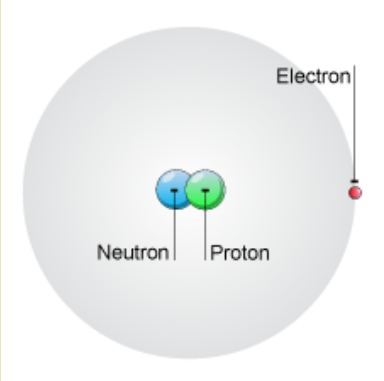
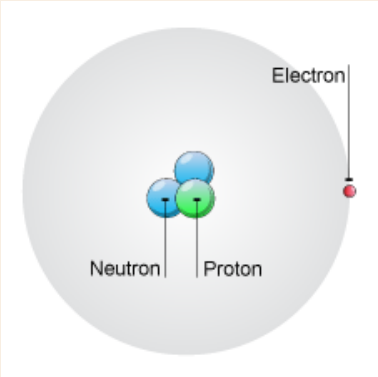
Physical Science
DSHS

Name_____
Period_____

isotope	symbol
hydrogen-1  1 proton, 0 neutron, 1 electron	$^{1}_{1}H$
hydrogen-2  1 proton, 1 neutron, 1 electron	$^{2}_{1}H$
hydrogen-3  1 proton, 2 neutrons, 1 electron	$^{3}_{1}H$

(Above) Three isotopes of hydrogen

Isotopes

An atom is made from a nucleus surrounded by electrons. The nucleus contains protons and neutrons. Isotopes are atoms that have the same number of protons, but different numbers of neutrons.

Atomic number and mass number

The number of protons in the nucleus of an atom is called its atomic number, it is always the same for atoms of a specific element, if it changes, the element also changes. The atoms of a particular element all have the same number of protons.

The atoms of different elements have different numbers of protons. The total number of protons and neutrons in an atom is called its mass number.

The most common isotope of Chlorine is chlorine-35. The number in the isotope name is the mass of that specific isotope

The number of protons is the atomic number (which is the smaller number) and can be found on the periodic table. In the example below, the atomic number is 17 and the mass number is 35. This means that each of these atoms has:

17 protons
17 electrons
35 - 17 = 18 neutrons

If we looked at the isotope chlorine-37 then the protons, electrons and neutrons would be as follows:

17 protons
17 electrons
37 - 17 = 20 neutrons

Isotopes are the atoms of the same element with different numbers of neutrons. They have the same number of protons, but different mass numbers.

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1. Is the following sentence true or false? **Explain**

"Two atoms of the same element can have different numbers of protons."

2. Circle the letters that identify quantities that are always equal to an element's **atomic number.**
   a. number of nuclei
   b. number of protons
   c. number of neutrons
   d. number of electrons

3. Circle the letters that identify quantities that contribute to the **mass** of an atom.
   a. number of shells
   b. number of protons
   c. number of neutrons
   d. number of electrons

4. Every atom of a given element has the **same** number of _____.

5. Every atom of a given element **does not have the same** number of _____.

6. What are isotopes?

7. All oxygen atoms have 8 protons. Circle the letter of the number of **neutrons** in an atom of oxygen-20.

a. 20	b. 8
c. 12	d. 28

8. **In your reading outline 4.2 you read about "heavy water"** or water made from the combination of oxygen with hydrogen-2 atoms instead of the normal hydrogen-1 atoms. **Explain why it makes sense for this to be called heavy water.**

9. Circle the atoms that are isotopes of one another:

Helium-4	Beryllium-10	Boron-10
Beryllium-9	Lithium-9	Hydrogen-3